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ABSTRACT

CARE (Computer Assisted Renewal Education) is a mobile computer assisted instruction (CAI) program designed to train educators and inservice teachers in the education and handling of handicapped children. The program, developed by Pennsylvania State University and offering college credit, is carried in an expandable trailer with 16 individual student terminals. The CARE curriculum currently offers four basic courses: early identification of handicapped children, diagnostic and prescriptive teaching of preschool and primary children (two courses), and education of visually handicapped children. Two additional courses are planned for the CARE program and their development will follow the step-by-step course development procedures previously established. An evaluation was performed on the first CARE course, identification of handicapped children. The results of the evaluation, which included a two-group t-test of achievement scores with conventional instruction as a control and a student questionnaire, indicated that the CAI students scored significantly higher in achievement, needed less instruction time, and appreciated the program. (WH)

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# CARE: COMPUTER ASSISTED RENEWAL EDUCATION

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To provide for the 4 million handicapped children in the United States who are not receiving an adequate education, 300,000 more specially trained persons are needed. Because the present methods of training educational personnel cannot provide enough trained people to meet these needs, The Pennsylvania State University has developed a series of computer-assisted instruction courses for training regular educators to teach handicapped children and two mobile CAI laboratories for delivering the instruction to inservice teachers in their home community -- CARE: Computer Assisted Renewal Education. The curriculum and the delivery system for educational services are built on the twin concepts of individualized instruction and mobility.

## The Delivery System

CARE is delivered to teachers and educators in all parts of the country via custom-built mobile laboratories each housing an IBM 1500 computer-assisted instruction system and sixteen student stations. In the closed condition, the forty-foot van is only eight feet wide and meets the highway specifications of every state in the Union. After reaching its destination the van is expanded to provide a comfortable air-conditioned learning environment which is seventeen feet wide.

On a prearranged schedule, the mobile CAI laboratory is moved to a community school and connected to electric and telephone services. An instructional manager travels with each Laboratory and trains proctors and a systems operator hired in the local community. The local personnel provides a strong link with the community and extends the use of the mobile laboratory to 80 hours per week. Over the next twelve weeks elementary teachers, head start teachers, and day care workers are scheduled for one-to-three hour

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sessions at computer terminals. Each teacher-student arranges a flexible and irregular schedule at the computer terminals to fit into the demands of her personal life.

Each student station is equipped with a small cathode ray tube (CRT) on which is displayed alphameric information plus a wide variety of graphics including animated illustrations. Students respond to questions using a typewriter-like keyboard and a light-sensitive pen. In addition to the CRT, each student station has a rear-screen image projector for displaying color photographic images from a 1020-frame, 16mm film with each frame randomly accessible by the computer. The third display component is an individual audio play/record device with randomly accessed, prerecorded messages on standard 1/4-inch audio tape.

The students interact at the terminals with an adaptive instructional program which has been prepared and tested by faculty members of The Pennsylvania State University in cooperation with the staff of the Computer Assisted Instruction Laboratory. In addition to the computer stored instruction, each student may be required to use a handbook, materials for testing young children, and other appropriate teaching tools. Branching and individualizing teaching strategies have been introduced into the courses to the extent that the present state-of-the-art supports inclusion of these techniques.

When the teacher-student completes a course, he takes a final examination generated by the computer from a pool of test questions covering the objectives of the course. Teacher-students are awarded marks and receive graduate level college credit (either by The Pennsylvania State University or by a participating local college or university) appropriate to the amount of curriculum included in the program. The faculty member in charge of the course is available from time to time to talk with students in person and can be reached by a telephone located in the vehicle. A complete record of each participant's performance on the test and the course is recorded by the computer for summarization, marking, and course improvement by the authors.

Given good teaching material, the success of the program hinges primarily on two major features, the interactive quality and flexibility of the instruction at the computer terminal. With the computer as an interactive processor, a CAI course creates a responsive environment for learning which is in sharp contrast

with the passive learning situations which most learners encounter in contemporary mass education. Adult students on CARE report strong feelings of concentration, quick passage of time at the terminals, and deep involvement in the subject matter.

Flexibility includes variable instruction tailored to each student's background knowledge, interests and responses; and learner controlled pacing and scheduling. Several school administrators who have taken CARE have commented on their appreciation of the opportunity to be out-of-town for ten to fifteen days and to return precisely to the point of instruction where they had previously left off.

The major advantage of this program is that it brings an individualized, quality course of instruction on a timely subject to groups of education practitioners who would not otherwise get the benefit of retraining and upgrading. As a by-product, experience in the mobile computer-assisted instruction facility will make teachers more aware of technological advances in education than they are presently and will dispell the aura of mystery and distrust surrounding computers.

## The CARE Curriculum

CARE (Computer Assisted Renewal Education), is made up of wholly self-contained, college-level, computer-assisted instruction courses for regular classroom teachers to develop clinical sensitivity and a diagnostic awareness and understanding of the strengths and weaknesses of handicapped and normal children.

CARE is principally oriented toward inservice, preschool, and primary-level elementary teachers because, as specialists point out, unrecognized problems and resulting lack of remedial treatment at this stage in a child's development may cause the child to be academically retarded by the age of nine or ten years. The courses are also of interest to other educational personnel as well -- secondary teachers, principals, supervisors; special class supervisors; school nurses, psychologists, aides; special services personnel; and day-care workers.

CARE 1: Early Identification of Handicapped Children (3 Credits)

Handicapped children are those children who display deviations from normal behavior in the cognitive, affective, and/or psychomotor domain. Principal emphasis is directed toward atypical conditions or characteristics having relevance for teaching (Cartwright & Cartwright, 1973a). The course materials encourage teachers to view children as individuals and illustrate that the most fruitful approach for improving education is for teachers to work with the observable behaviors of children. The use of traditional categories is minimal; however, certain terms and concepts related to handicapping conditions are taught so that students are better able to communicate with other professionals concerned with handicapped children.

Upon completion of the course, participants will be able to:

1. Identify characteristics and symptoms of handicapped children indicative of potential learning problems.
2. Screen children in regular classrooms for deviations and determine the extent of the inter-individual differences.
3. Select and use the appropriate commercial and teacher-constructed appraisal and diagnostic procedures in order to obtain precise information as to the nature of the deviation.
4. Prepare profiles of each child's strengths and weaknesses on educationally-relevant variables.
5. Evaluate the adequacy of the available information and make appropriate referrals to specialists.
6. Prepare adequate documentation if a referral is made.

Students are taught to systematically evaluate children's learning potential and formulate appropriate educational plans according to the Decision Model for the Identification of Handicapped Children (Figure 1) developed for CARE 1.

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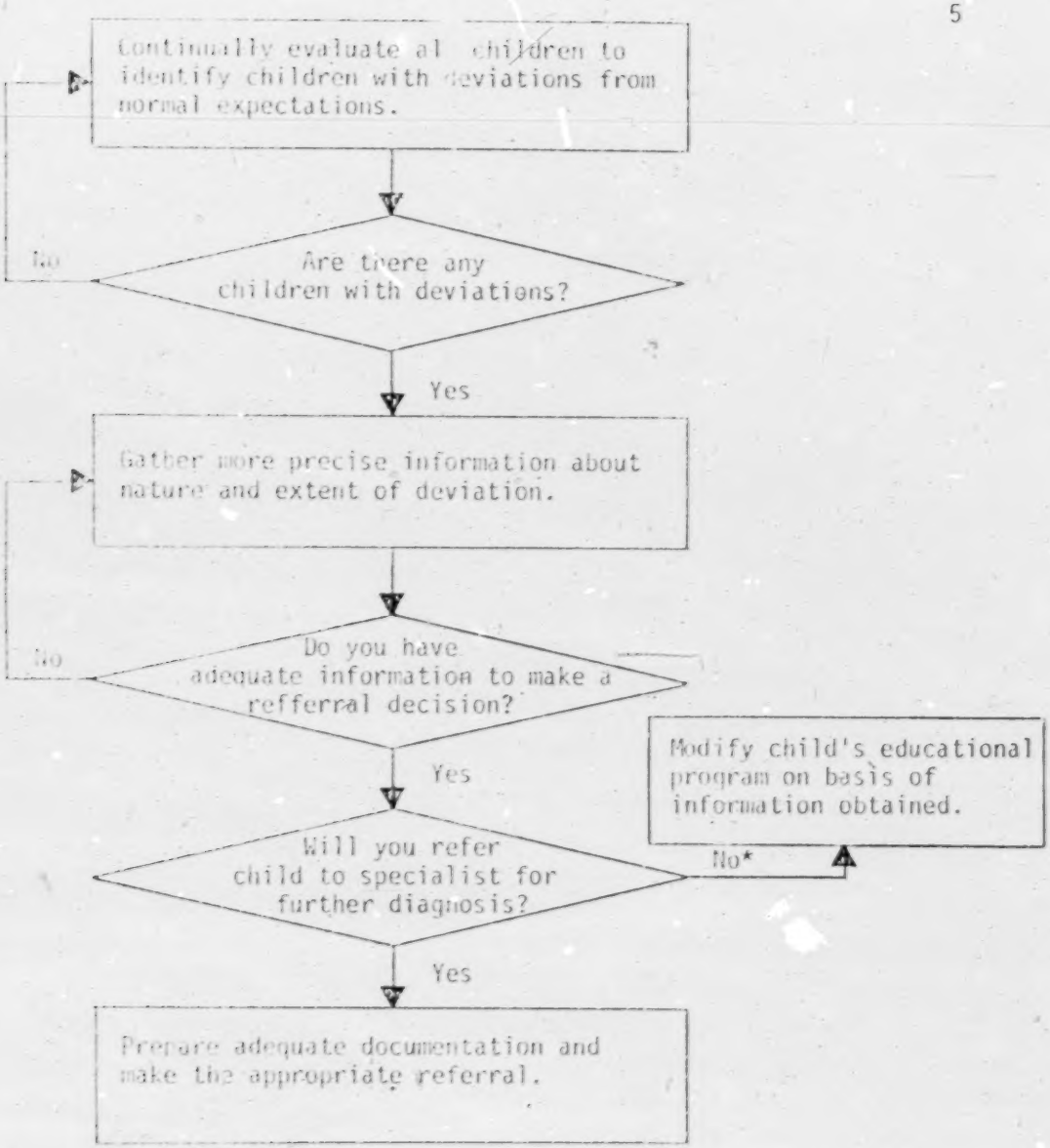
Continually evaluate al children to identify children with deviations from normal expectations.
Are there any children with deviations?
No
Yes
Gather more precise information about nature and extent of deviation.
Do you have adequate information to make a refferral decision?
No
Yes
Modify child's educational program on basis of information obtained.
Will you refer child to specialist for further diagnosis?
No*
Yes
Prepare adequate documentation and make the appropriate referral.

* This step is the subject of the second decision model.

Fig. 1. Decision Model for the Identification of Handicapped Children.

CARE 2 and CARE 3: Diagnostic Prescriptive Teaching of Preschool and Primary Children (3 Credits Each)

CARE 2 and CARE 3 are designed to prepare teachers of preschool children (CARE 2) and teachers of primary-grade children (CARE 3) to work effectively with children who may be experiencing learning difficulties (Cartwright & Cartwright, 1973b). Teaching personnel are taught to follow the Diagnostic Teaching Model (Figure 2) as they deal with children's learning problems in the affective and cognitive domains. Eight global competencies are required to carry out the procedures specified in the model:

1. Identify characteristics of individual children that indicate special teaching or management procedures are required.
2. Specify relevant educational objectives for individual children.
3. Select effective classroom management techniques.
4. Choose and use specialized teaching strategies for teaching specific objectives for children with varying behavioral and learning characteristics.
5. Choose and use special materials in association with specific strategies.
6. Identify and use appropriate evaluation procedures.
7. Use existing sources of specialized strategies and materials.
8. Consult with resource persons for assistance.

A modular approach (Figure 3) was used in the development of CARE 2 and CARE 3: both courses share a core of information, procedures, and strategies, but examples and simulated case studies in which the students apply the principles, are appropriate for the age-group of children to which each is directed.

CARE 4: Education of Visually Handicapped Children (1 Credit)

CARE 4 Education of Visually Handicapped Children focuses on teaching children who are partially seeing or blind (Ward & Peabody, 1972). The course equips preservice and inservice classroom teachers and other school personnel with the knowledge and skills necessary to work effectively with visually handicapped children in regular classes.

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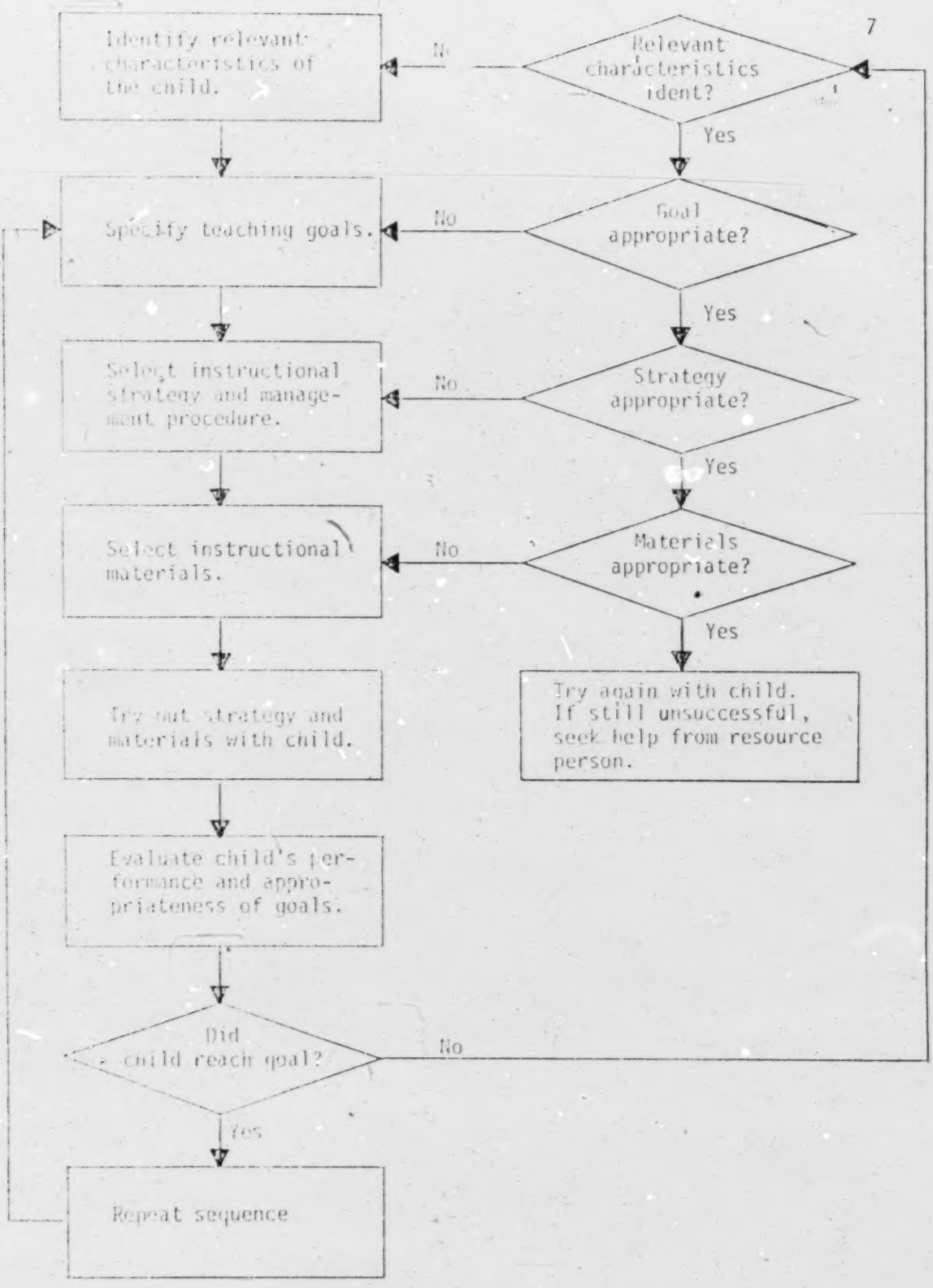


Fig. 2. Decision Model for Diagnostic Teaching.

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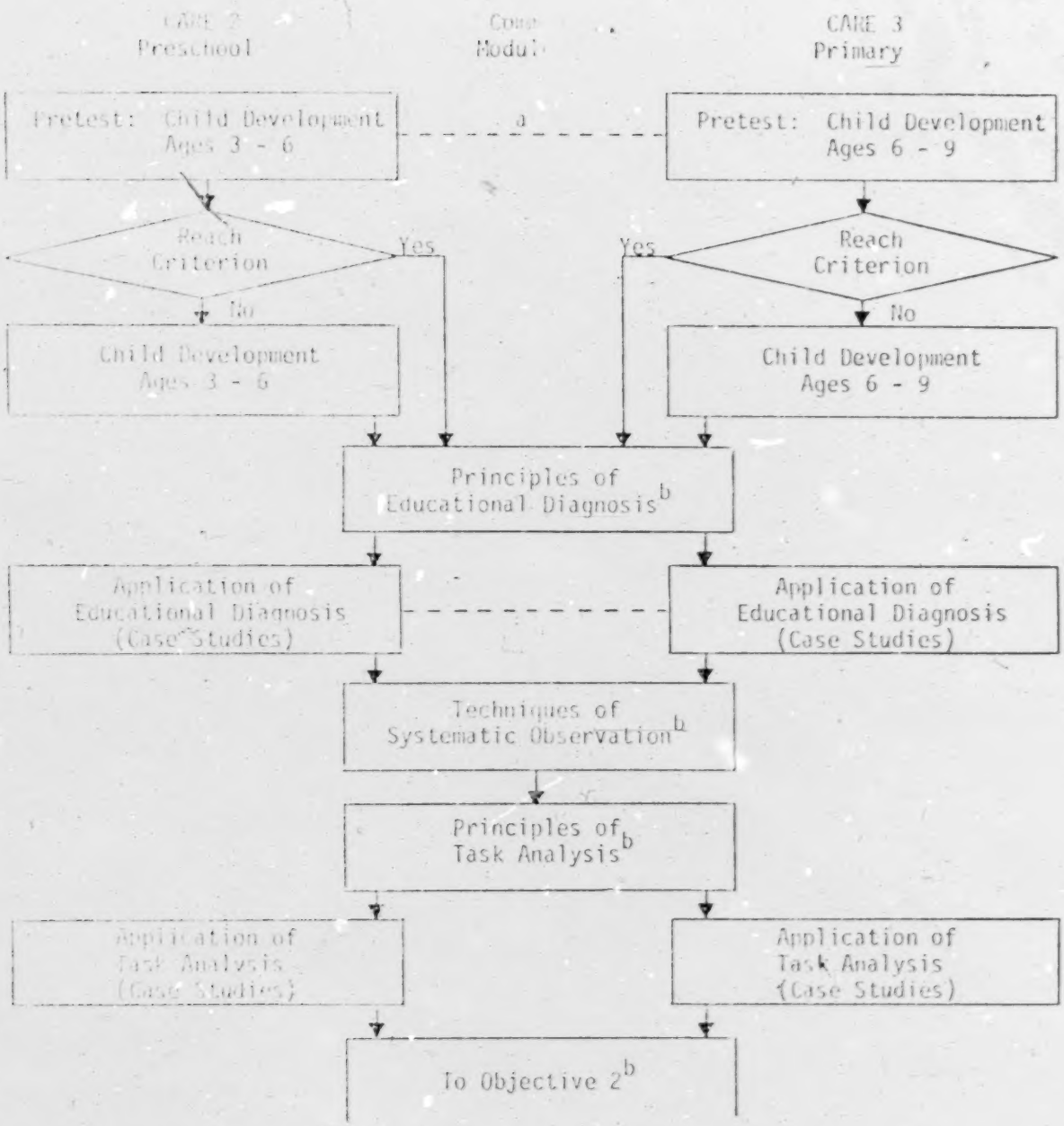


[a] Dashed line indicates that the same format is used for both courses; teaching strategy (and programing) are the same but content differs.

[b] Basic content and strategies are the same for both.

Fig. 3. Relationship Between CARE 2 and CARE 3 Modules.

Objectives for CARE 4 enables the teacher to use the Diagnostic Teaching Model developed for CARE 2 and CARE 3 in teaching children with limited vision. Participants who complete CARE 4 are expected to:

1. Identify educationally relevant characteristics of visually handicapped children.
2. Construct instructional objectives for these children.
3. Select suitable media and materials for instruction.
4. Arrange proper classroom environmental conditions.
5. Design instructional procedures to facilitate learning.
6. Utilize appropriate techniques for evaluating performance.

Proposed Courses

Two additional courses have recently been proposed for the CARE series: CARE 5 is intended to enable regular classroom teachers to enhance the learning of hearing-impaired children through proper classroom environment and CARE 6 for teachers of children who have been designated severely handicapped will include modular competency-based learning experiences dealing with the development, assessment, and educational programing of severely handicapped children.

Course Development Procedures

The general steps of a rigorous research and development procedure required to produce a CAI course include:

1. On-campus consultation -- basic ideas and strategies are reviewed with colleagues.
2. Preliminary literature review.
3. Grant request prepared -- course content and strategies, as well as developmental procedures, are spelled out in detail; independent field readers review proposal and make suggestions for revision, and federally appointed consultants review preliminary materials with staff.

4. Extensive literature review.
5. Consultation -- CAI and content specialists consult with staff.
6. Preparation of first program draft.
7. Staff review -- staff and authors review drafts of materials.
8. Student tryout -- staff members observe 15-20 students using the materials.
9. Curriculum revision -- using data collected from student tryout.
10. Student tryout -- 20-25 students try out the revised materials "on their own."
11. Curriculum revision.
12. Operational field test -- 100-125 students take the course for credit in an independent field environment to assure that the course is "exportable."
13. Implementation of curriculum.

The course is revised after each one of the steps. For steps 1 through 5 above, revisions are based upon expert opinion and related literature (learning theory, CAI, special education). In steps 8, 10, and 12 extensive student data are collected to provide the information needed for improvement. In steps 9 and 11, major revisions in course content and strategy are made based on the student performance records.

Further revisions are based on student records collected across sites. For example, revisions to CARE 1 have been based on analysis of over 500,000 student responses made by 2,000 students over a period of two years.

Curriculum/Student Evaluation

Educators who have taken the courses report a high degree of satisfaction with the curriculum and with the method of instruction. Measured average increases in subject matter achievement on the part of participants have been substantial. During the Winter Term 1971, all students who were enrolled in CARE 1 were randomly assigned to either computer-assisted instruction (CAI) or conventional instruction (CI). The CAI group (n = 27) received all instruction by means of CAI and did not attend classes with the CI group. The CI group

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(n = 87) received the conventional lecture-discussion method of instruction and met three days per week in 75 minute sessions for ten weeks. All students, CAI and CI, were regular students enrolled for undergraduate or graduate credit. The instructor of the CI group was an author of the CAI course and helped plan the structure and the objectives of the CAI course -- both the CAI and the CI courses were designed to reach the same objectives.

The dependent variables were time and final examination scores based on 75 items. Results are shown in Table 1.

Table 1

Comparison of Final Examination Scores and Instructional Time for CAI and CI Students

| Instructional Mode | Final Examination Scores | | | Time in Hours** |
|---|---|---|---|---|
| | $\bar{X}$ | S.D. | t | |
| Computer Assisted Instruction | 65.69 | 4.68 | | 25.21 |
| Conventional Instruction | 52.78 | 5.89 | 11.65* | 37.50 |

* This difference is statistically significant with $p < .001$.

** CAI time is mean time per student and the time for conventional instruction is the total hours scheduled in lecture session for all students.

These data indicate that the group of students instructed by CAI obtained a mean score 24% higher on the final examination than did the CI students. Furthermore, the CAI students completed the course in 12 hours less time (33%).

Further evaluative information was obtained from a study of the opinions of 31 regular classroom teachers in Pennsylvania. These teachers took the CARE I course during September and October of 1971. A follow-up study was made in July of 1972. Some typical results are shown in the following:

Would you say that after taking the course you were more aware of individual differences in children?

Yes - 94%; No - 6%

As a result of taking the course, do you feel better able to identify behaviors which may be signs of potential learning problems?

Yes - 100%; No - 0%

Would you take another course by CAI?

Yes - 100%; No - 0%

Did you find that CAI was a more convenient way of taking the course then attending classes at a local college or university?

Yes - 100%; No - 0%

These results can be summarized briefly as follows: First, inservice teachers do find the content of CARE 1 to be useful in dealing with the needs of children; and second, they like instruction by computer in that 100% say they would take another course by CAI and they feel that CAI is more convenient than attending classes in a college or university.

Following are excerpts from statements by CARE students and a school administrator:

". . . My mother, who is a sixth-grade school teacher, has had for years a hearing problem. About ten years ago, it became serious enough for her to wear a hearing aid. . . One particular part of your computer-assisted course helped me to understand how my mother's hearing problem caused her to have such a low tolerance for some kinds of noise -- it was the part that took such sounds and scrambled them so that they would come across to one with normal hearing something like they sound to one with a hearing handicap. . . With this new understanding of hearing losses and the effect they have on behavior, I talked with my father about encouraging my mother to see a specialist. . . . Yesterday, my mother discovered that her condition is operable with 99% chance of success. You can appreciate my excitement and my sense of gratitude to you and to those who shared with you the building of your course. One thing seems particularly significant to me. In a conventional kind of

course, I might have acquired the same basic "information," but I would never have heard what a person with a hearing handicap hears. It was the intelligent and imaginative use of technology that gave me the ability to link together the data of the course with my mother's behavior to draw the inferences I drew and to share them with my parents. Thank you..."

". . . My colleagues here and at the University of Houston agree that this is one of the most impressive developments we have seen toward the end of providing a continuous progress individualized learning program. As you know, CARE 1 is being taken by administrators from every level of the system, educational specialists, counselors, nurses, teachers, and full-time students, and their response has been overwhelmingly favorable. The course content and the format are excellent. This is no doubt the most comprehensive course of its kind in the country. . . After such a positive experience with this project, we are dismayed to think of it ever leaving, but we are hopeful you will be able to schedule us again in the near future..."

". . . I liked it because I was given much learning in a short time without having to travel a long distance."

". . . After two years of PSU's mass education it was a joy to get some individual attention."

". . . I liked it because it enabled me to take an active part. I find regular classroom instruction very boring."

". . . The course seems relevant to the teachers who will use the material presented every day. . . Can't wait for a follow-up course in remedial techniques."

". . . I liked the freedom of scheduling my own time and not having a strict schedule."

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